CLAIMS

I claim:

1. A controlled, magnetohydrodynamically-driven, fluidic network, comprising:

(a) a plurality of connected and individually controlled conduits for the transmission of an at least slightly conductive fluid each conduit having at least one pair of opposing walls and at least one pair of electrodes disposed along the opposing walls; and

(b) at least one electrode controller in operational engagement with the electrodes for implementing an activation sequence of currents or potentials applied across the electrodes.

2. The network of claim 1 further comprising an algorithm for determining the activation sequence.

3. The network of claim 1, comprising a plurality of ceramic tapes co-fired into a unitary structure.

4. The network of claim 1 wherein the conduits are arrayed in two dimensions.

5. The network of claim 1 wherein the conduits are arrayed in three dimensions.

6. The network of claim 1 wherein the conduits are spatially defined by the arrangement of the electrodes.

7. A method for generating Lorentz body forces in an at least slightly conductive fluid within the fluidic network of claim 1 comprising the step of placing the fluidic network of claim 1 at least partially within a magnetic field oriented approximately perpendicular both to the orientation of the axis of flow of the liquid through the fluidic network and to the orientation of a current or potential applied across the electrodes disposed along the opposing walls of the conduits.

8. A method for controlling the flow of an at least slightly conductive fluid within the fluidic network of claim 1 comprising the step of implementing an activation sequence of currents or potentials having specific magnitudes and polarities across specific electrode pairs of the fluidic network of claim 1 for specific time intervals.

9. The method of claim 8 wherein the activation sequence is determined by an algorithm.

10. The method of claim 9 wherein the activation sequence is determined prior to its implementation in the fluidic network.

11. The method of claim 9 wherein the activation sequence is determined with information about the state of the fluidic network or of the fluid circulating within the network during operation.

12. A controlled, magnetohydrodynamically-driven thermal cycler comprising the fluidic network of claim 1 positioned at least partially across a temperature gradient.

13. A method for cycling a fluid through different temperature zones comprising the step of operating the fluidic network of claim 1 across a temperature gradient.

14. A method for promoting polymerase chain reactions comprising the step of cycling a fluid containing polymerase chain reaction reagents through the fluidic network of claim 1 across a temperature gradient.

15. A magnetohydrodynamic stirrer, comprising:

(a) a conduit or chamber;

(b) at least two electrodes positioned within the conduit or chamber such that the application of a current or potential across the electrodes in a magnetic field generates chaotic advection in a fluid within the conduit or chamber; and

(c) at least one electrode controller in operational engagement with the electrodes for controlling the application of the current or potential across the electrodes.

16. The stirrer of claim 15 wherein the conduit or chamber is defined by walls and the current or potential is alternately applied between at least two electrodes positioned away from the walls of the conduit or chamber and one electrode disposed along one of the walls.

17. The stirrer of claim 15 wherein the conduit or chamber is defined by walls and the current or potential is alternately applied between an electrode positioned away from the walls of the conduit or chamber and at least two electrodes disposed along at least one wall.

18. The stirrer of claim 17 wherein the two electrodes disposed along at least one wall are disposed on the same wall.

19. The stirrer of claim 17 wherein the two electrodes disposed along at least one wall are disposed on different walls.

20. The stirrer of claim 15 wherein the conduit or chamber is defined by walls and the polarity of the electric field between the one or more stirring electrodes and the one or more electrodes disposed along the walls of the conduit is repeatedly reversed.

21. The stirrer of claim 15 wherein the current or potential is alternately applied between two electrodes wherein at least one of the electrodes is movable between at least two positions.

5